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I claim:

1. A golf ball comprising a syndiotactic 1,2-polybutadiene having a crystallinity between about 5% and about 50%, a mean molecular weight between about 10,000 and about 350,000, and a percentage of 1,2-bonds greater than about 70%.
2. A golf ball as defined in claim 1, wherein the golf ball comprises a syndiotactic 1,2-polybutadiene having a crystallinity between about 10% and about 40%.
3. A golf ball as defined in claim 2, wherein the golf ball comprises a syndiotactic 1,2-polybutadiene having a crystallinity between about 15% and about 30%.
4. A golf ball as defined in claim 1, wherein the golf ball comprises a syndiotactic 1,2-polybutadiene having a mean molecular weight between about 50,000 and about 300,000.
5. A golf ball as defined in claim 4, wherein the golf ball comprises a syndiotactic 1,2-polybutadiene having a mean molecular weight between about 80,000 and about 200,000.
6. A golf ball as defined in claim 5, wherein the golf ball comprises a syndiotactic 1,2-polybutadiene having a mean molecular weight between about 100,000 and about 150,000.

7. A golf ball as defined in claim 1, wherein the golf ball comprises a syndiotactic 1,2-polybutadiene having a percentage of 1,2-bonds greater than about 80%.

8. A golf ball as defined in claim 7, wherein the golf ball comprises a syndiotactic 1,2-polybutadiene having a percentage of 1,2-bonds greater than about 90%.

9. A golf ball as defined in claim 1, further comprising UV stabilizers, photostabilizers, photoinitiators, co-initiators, antioxidants, colorants, dispersants, mold releasing agents, processing aids, inorganic fillers, organic fillers, or mixtures thereof.

10. A golf ball composition comprising:
a syndiotactic 1,2-polybutadiene having a crystallinity between about 5% and about 50%, a mean molecular weight between about 10,000 and about 350,000, and a percentage of 1,2-bonds of greater than about 70 %; and
5 ionomeric polymers, non-ionomeric polymers, or mixtures thereof;
wherein the ratio by weight of syndiotactic 1,2-polybutadiene to the ionomeric polymers and non-ionomeric polymers ranges between about 5:90 and about 90:5.

11. A golf ball composition as defined in claim 10, wherein the ratio by weight of syndiotactic 1,2-polybutadiene to the ionomeric polymers and non-ionomeric polymers ranges between about 10:90 and about 80:20.

12. A golf ball composition as defined in claim 11, wherein the ratio by weight of syndiotactic 1,2-polybutadiene to the ionomeric polymers and non-ionomeric polymers ranges between about 10:90 and about 70:30.

13. A golf ball composition as defined in claim 10, wherein the ionomeric polymers comprise copolymeric polymers, terpolymeric polymers, or mixtures thereof.

14. A golf ball composition as defined in claim 10, further comprising a crosslinking agent, co-crosslinking agent, crosslinking accelerator, or mixtures thereof.

15. A golf ball composition as defined in claim 14, wherein the ratio by weight of crosslinking agent to syndiotactic 1,2-polybutadiene, ionomeric polymers and non-ionomeric polymers ranges between about 0.1:100 and about 10:100.

16. A golf ball composition as defined in claim 15, wherein the ratio by weight of crosslinking agent to syndiotactic 1,2-polybutadiene, ionomeric polymers and non-ionomeric polymers ranges between about 0.1:100 and about 5:100.

17. A golf ball composition as defined in claim 14, wherein the ratio by weight of crosslinking accelerator and co-crosslinking agent to syndiotactic 1,2-polybutadiene, ionomeric polymers and non-ionomeric polymers ranges between about 0.1:100 and about 20:100.

18. A golf ball composition as defined in claim 17, wherein the ratio by weight of crosslinking accelerator and co-crosslinking agent to syndiotactic 1,2-polybutadiene, ionomeric polymers and non-ionomeric polymers ranges between about 0.1:100 and about 10:100.

19. A golf ball composition as defined in claim 10, further comprising a copolymer having a glycidyl group, hydroxyl group, maleic anhydride group or carboxylic group.

20. A golf ball composition as defined in claim 19, wherein the ratio by weight of copolymer having a glycidyl group, hydroxyl group, maleic anhydride group or carboxylic group to the syndiotactic 1,2-polybutadiene, ionomeric polymers and non-ionomeric polymers ranges between about 1:100 and about 20:100.

21. A golf ball composition as defined in claim 20, wherein the ratio by weight of copolymer having a glycidyl group, hydroxyl group, maleic anhydride group or carboxylic group to the syndiotactic 1,2-polybutadiene, ionomeric polymers and non-ionomeric polymers ranges between about 1:100 and about 15:100.

22. A method for making a golf ball, comprising:
preparing a composition comprising a syndiotactic 1,2, polybutadiene having a crystallinity between about 5% and about 50%, a mean molecular weight between about 10,000 and about 350,000, and a percentage of 1,2-bonds greater than about 70 %; and
incorporating the composition into the golf ball.

23. A method as defined in claim 22, wherein the step of preparing a composition comprises a step of dry-blending the composition.

24. A method as defined in claim 22, wherein the step of preparing a composition comprises a step of mixing the composition using a mill, internal mixer or extruder.

25. A method as defined in claim 24, wherein the step of mixing the composition comprises melting the composition.

26. A method as defined in claim 22, wherein the step of preparing a composition comprises:

preparing a concentrate comprising:

5 a syndiotactic 1,2, polybutadiene having a crystallinity between about 5% and about 50%, a mean molecular weight between about 10,000 and about 350,000, and a percentage of 1,2-bonds greater than about 70 %; and

10 a crosslinking agent, a crosslinking accelerator, a co-crosslinking agent, a copolymer having a glycidyl group, a hydroxyl group, a maleic anhydride group, or a carboxylic group, a terpolymer having a glycidyl group, a hydroxyl group, a maleic anhydride group, or a carboxylic group, or mixtures thereof; and

adding the concentrate to a syndiotactic 1,2, polybutadiene having a crystallinity between about 5% and about 50%, a mean molecular weight between about 10,000 and about 350,000, and a percentage of 1,2-bonds greater than about 70%, an ionomeric polymer, a non-ionomeric polymer, or mixtures thereof.

27. A method as defined in claim 22, wherein the step of preparing a composition comprises:

preparing a concentrate comprising:

an ionomeric polymer and

5 a crosslinking agent, a crosslinking accelerator, a co-crosslinking agent, a copolymer having a glycidyl group, a hydroxyl group, a maleic anhydride group, or a carboxylic group, a terpolymer having a glycidyl group, a hydroxyl group, a maleic anhydride group, or a carboxylic group, or mixtures thereof; and

10 adding the concentrate to a syndiotactic 1,2, polybutadiene having a crystallinity between about 5% and about 50%, a mean molecular weight between about 10,000 and about 350,000, and a percentage of 1,2-bonds greater than about 70 %, an ionomeric polymer, a non-ionomeric polymer, or mixtures thereof.

28. A method as defined in claim 22, wherein the step of preparing a composition comprises.

preparing a concentrate comprising:

a non-ionomeric polymer and

5 a crosslinking agent, a crosslinking accelerator, a co-crosslinking agent, a copolymer having a glycidyl group, a hydroxyl group, a maleic anhydride group, or a carboxylic group, a terpolymer having a glycidyl group, a hydroxyl group, a maleic anhydride group, or a carboxylic group, or mixtures thereof; and

10 adding the concentrate to a syndiotactic 1,2, polybutadiene having a crystallinity between about 5% and about 50%, a mean molecular weight between about 10,000 and about 350,000, and a percentage of 1,2-bonds greater than about 70 %, an ionomeric polymer, a non-ionomeric polymer, or mixtures thereof.

29. A method as defined in claim 22, wherein the step of incorporating the composition into a golf ball comprises injection molding the composition to form a spherical layer of the golf ball. .

30. A method as defined in claim 22, wherein the ball comprises a central portion and the step of incorporating the composition into a golf ball comprises:

5 injection molding the composition to form a first and a second half shell, the half shells configured to mate to form a spherical layer; and
compression molding the first and second half shells over the central portion to form a spherical layer.

31. A method as defined in claim 22, wherein the step of incorporating the composition into a golf ball comprises incorporating a composition comprising a crosslinking agent, co-crosslinking agent, crosslinking accelerator, or mixtures thereof into the golf ball.

32. A method as defined in claim 31, wherein the step of preparing the composition comprises inducing crosslinking in the composition during mixing of the composition.

33. A method as defined in claim 31, wherein the step of incorporating the composition into a golf ball comprises inducing crosslinking in the composition by injection molding the composition to form a portion of the golf ball.

34. A method as defined in claim 33, wherein the step of inducing crosslinking in the composition by injection molding the composition comprises forming dimples on an outer surface of the portion.

35. A method as defined in claim 31, wherein the step of incorporating the composition into a golf ball comprises injection molding the composition to form a portion of the golf ball; and
inducing crosslinking of the composition by compression molding the
5 portion.

36. A method as defined in claim 35, wherein the step of inducing crosslinking in the composition during compression molding of the composition comprises forming dimples on an outer surface of the portion.

37. A method as defined in claim 33, wherein the step of incorporating the composition into a golf ball comprises inducing crosslinking in the composition by exposing the composition to radiation of an intensity and type sufficient to induce crosslinking.

38. A method as defined in claim 31, wherein the step of incorporating the composition into a golf ball comprises:
injection molding the composition to form two half-shells configured to form a spherical layer when joined together; and
5 inducing crosslinking in the composition by compression molding the two half-shells to join the half-shells to form a spherical layer of the golf ball.